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Boundless and Bounded Interactions in the Knowledge Work Process: The Role of Groupware Technologies

Niall Hayes

The Department of Organisation, Work and Technology
Lancaster University Management School
Lancaster LA1 4YX
UK

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Niall Hayes

The Department of Behaviour in Organisations,

The Management School,

Lancaster University,

LA1 4YX, UK.

n.hayes@lancaster.ac.uk

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Abstract. This article discusses how the disembedding of social relations and their rearticulation across different tracts of time and space are implicated in knowledge working. We explore this theme within the context of the UK selling division of a multi-national pharmaceutical company. We will examine how the use of a groupware technology was used to work across the functional, geographic and temporal boundaries that separated many employees, and most notably the sales force from those who were located at the head office. Specifically, we will consider the opportunities and limitations that surrounded the use of groupware to work within and between these boundaries. We will also discuss the innovative strategies that some employees devised to work around these difficulties. Knowledge production is conceptualised from a communities of practice perspective, and further sensitised with reference to Giddens thesis on the nature of contemporary society.

Key words: Computer supported cooperative work(CSCW), groupware, time/space, knowledge work, communities of practice, late-modernity.

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1. Introduction

Knowledge work is a relatively new and dynamic area of research that has emerged as a direct response to the changing organising processes that pervade many contemporary organisations. Commentators suggest that contemporary organisations are becoming dependent on workers that ply their trade through their intellective abilities and their specialised knowledge rather than their physical abilities(Blackler,1995). Organisations are increasingly portrayed to comprise of a high proportion of qualified staff, whose intellective abilities are varied, difficult to duplicate and who frequently command high rewards(Blackler et al,1993). Knowledge creation is thought to be the result of collaboration between discipline based experts, or more significantly, as a result of collaboration between multi-disciplinary groups that are organised in non-traditional ways(Blackler et al,1997). Scarborough and Burrell(1997) identified two general approaches to conceptualising this area of study: those that treat knowledge as a commodity that is capable of being possessed and traded(Nonaka & Takeuchi,1994; Bell,1973), and those who portray knowledge as being relational, provisional and context bound(Lave,1988; Blackler et al,1997). The study reported in this paper can be located in the latter tradition, and views knowledge as residing in an evolving, continuously renewed set of relations of persons, their actions and the context that they are situated within(Tsoukas,1996; Lave & Wenger,1991).

Castells(1996), amongst others, views the emergence of these new ways of organising as being inseparable from the development of ubiquitous, low cost distributed

technology(Knights et al.,1993; Ruhleder,1995). He believes that recent technological developments have ushered in a new division of labour based on the attributes/capacities of each worker rather than on the organisation of the task. Zuboff(1996) concurs with this view, suggesting that as technologies become more ubiquitous, they are: "fully imbuing tasks of every sort and providing ever more powerful opportunities for the kind of learning that translates into value creation".

Central to the role of information systems in the knowledge work process is their ability to allow employees to work within and between functional, geographic and time boundaries. One technology that is seen as particularly appropriate to support the knowledge work process is groupware(Ciborra,1996; Hayes & Walsham,2000b). Groupware technologies provide a facility to open up a new network of relationships between employees that have previously worked spatially and temporally quite separately from each other. Indeed, Lotus'(WWW1998) claim that groupware: "eliminates the constraints that job title, time, and location place on organisational communication".

However, within the academic literature, there have been very few empirical studies that have explicitly considered groupware and knowledge working and those that have, have reported mixed experiences. Quinn et al's(1996) study of Merrill Lynch and NovaCare found that groupware, in tandem with new incentive systems and the inversion of the traditional hierarchical structure, allowed both organisations to tailor themselves to the particular way their professional intellect creates value. Orlikowski's(1993) study of Alpha, a consulting company, provided a more complex account. She found that the competitive promotion and financial reward structure led to Notes remaining largely unused by consultants. However, she found that between the technologists and senior consultants, who were not subject to the competitive culture, Notes was used to share their knowledge

and experience in order to aide them in conducting their work. Similarly, in Hayes & Walsham's(2000b) empirical study of the use of groupware in a pharmaceuticals company, the political and normative context was seen as being fundamental to shaping the knowledge work process. Outside the CSCW literature, several other empirical studies have considered the positive and negative implications arising from the disembedding mechanism communication technologies provide. Disembedding mechanisms allow for social relations to be 'lifted out' of their traditional locale and be 'rearticulated' across indefinite tracts of time and space(Giddens, 1991). For example, Barrett & Walsham's(1999) study of the introduction of an electronic trading system in the insurance industry found that while the system had led to concerns about losing face-to-face interactions and their current expertise, it had also presented them with some opportunities for reskilling, flexible working and access to other insurance markets. Walsham(1998) based his analysis on three different empirical contexts, and found that work was able to be structured and controlled more readily, while simultaneously supported local practice in a way that was beneficial to employees.

Emerging from this brief review are two important observations. First, there has been a paucity of interpretivist empirical studies that have explicitly considered how information systems are implicated in time-space distanciation, and secondly, non have explicitly examined this research theme in relation to knowledge working. This study makes a modest attempt to address these omissions in the literature. To explore how the disembedding and embedding facility that groupware provides enables and constrains knowledge work, this paper will consider the case of the UK selling division of a multi-national pharmaceutical firm. Compound UK(the selling division) introduced Lotus Notes(Notes), the leading groupware product, to assist employees to share and discuss views with members of their own and other functions often across different spatial and

temporal boundaries. Due to the issues that emerged, this paper largely focuses on the implications arising from the collaborative endeavours between the field force, who worked from their homes, and members of the other functions, who were located in the head office. The term boundary refers to working across the geographic, temporal and functional separations.

This paper is structured as follows. The subsequent section will present the conceptualisation of knowledge working that has underpinned the analysis in this paper. Following this, the methodological approach adopted in this study will be presented. The following four sections focus on the case of Compound UK. Section four introduces how Compound UK was structured, its economic environment, and the main components of Notes. Section five, six and seven explore the detailed issues that arose in relation to the opportunities, difficulties and novel strategies that surrounded the use of Notes to work within and between boundaries. The penultimate section explores the case material explicitly through the theoretical underpinnings of the study. The final section will discuss the conclusions and implications arising from this study.

2. Conceptualising CSCW and Knowledge Working

The communities of practice school is largely attributed to the work of Lave and Wenger(1991) and Brown and Duguid(1991). Boland and Tenkasi(1995) have subsequently drawn on these foundations specifically to conceptualise the role of communication technologies in the knowledge work process. Boland and Tenkasi(1995) see organisations as being characterised by a process of distributed cognition in which multiple communities of specialised knowledge workers, each dealing with a part of an overall organisational problem, interact to create the patterns of sense making and

behaviour displayed by the organisation as a whole. Each community of knowing consists of specialised knowledge workers, and includes divisions, functional areas, product lines, professional specialities, project teams and issue-based committees. Boland and Tenkasi(ibid.) explain that these communities interweave with each other across various levels of the organisation as: "individuals will find themselves as members of several communities of knowing operating within a firm and its environment". Communities are taken to be expert knowledge groups, who have their own unique social and cognitive repertoires that guide their interpretations of the world(Boland & Tenkasi,1995; Fleck, 1979).

Boland and Tenkasi(1995) developed the concepts of perspective making and perspective taking to refer to the ability to reconfigure the knowing of experts. *Perspective making* refers to the process whereby a community develops and strengthens its own knowledge domain and practices. As a perspective strengthens, it complexifies, which involves a shift from a global and undifferentiated construct to a more precise explanation, and a more coherent structure of meaning is created than the preceding ones.

The process of *perspective taking* refers to the process of collaboration between experts working across boundaries, when they are able to appreciate and synergistically utilise their distinctive knowledge(Blackler et al.,1997). Boland and Tenkasi(ibid.) suggest that making their own understandings visible for self-reflection is vital to the perspective taking process, and advocate communication technologies to support this process. Boland and Tenkasi(ibid.) further note that perspectives need protection from other demands whilst they are forming. They suggest that a new expanded sense of activity and community needs to emerge, born of an awareness of the changing context and a willingness to construct new meanings and methods.

3. Methodology

A qualitative research approach, informed by the principles underlying ethnography, has underpinned the empirical work undertaken in Compound UK. This approach emphasises the need for detailed understandings of human actions and meanings within specific contexts (Van Maanan,1979; Hammersly & Atkinson,1983). The research approach has sought to produce detailed descriptions of the everyday activities of members of Compound UK within their own place of work.

Phase	**Employees based at Compound Square**	**Members of the field force**	**Total**
Phase one	18	15	33
Phase two	9	11	20
Total	27	26	53

Table(1) Interview list in Compound UK

The fieldwork was conducted in two phases over a two and a half year period, during which fifty three in-depth semi-structured interviews were undertaken, lasting between one and two hours each. At the time of the initiation of this study, Notes had been in place for eighteen months. As table(1) indicates, during both phases, interviews were divided almost equally between members of the field force and employees working in Compound Square, with slightly more emphasis being placed on re-interviewing members of the field force during phase two due to the themes that emerged in the first phase. Interviews were semi-structured, starting with broad questions before becoming more focused as themes emerged from the previous interviews. The interviews were supplemented with informal discussions

and interactions over lunch and at social events in the evening. Throughout the research period, themes were developed through an iterative process. This involved categorising the field notes into issues and then themes with the assistance of QSR Nudist(Sage), and then "made sense of" by drawing on the theoretical approach that underpinned the research study.

The author was also conscious of how he may be perceived by interviewees. Consequently, at the start of each interview it was stressed that all transcripts would remain confidential, and that the outcome of this work was for academic rather than consultancy purposes. By adopting this strategy explicitly it was hoped that participants would be relatively frank and open in their responses.

4. Compound UK

Compound UK is concerned primarily with selling products to hospitals and general practices, whilst also undertaking clinical trials of new drugs with participating doctors in Great Britain and Northern Ireland. The selling division had undergone considerable change over the decade prior to the restructuring as a response to reforms in the UK health care sector, as outlined below.

During the late 1980's there has been an acceleration in the reform of the UK National Health Service(NHS). Government controls on public expenditure have meant that for a number of years the health care budget has not kept pace with inflation, and thus has reduced in real terms. To try and achieve cost savings, the NHS has attempted to mirror market principles by introducing an internal market place(Flynn & Williams,1997). This has led the NHS to rethink the purchase of pharmaceuticals products; the criteria for

purchasing such products no longer concentrates solely on their efficacy, but also on their cost and efficiency.

The introduction of these market reforms has split the health care sector between primary care and specialist care. The primary care sector covers general practices, while the specialist care sector covers hospital markets. Since the reforms, many primary care doctors are fund-holders. They have budgetary responsibilities for drugs, hospital referrals, staff as well as for their fixed costs. Hospitals are also more autonomous from the Department of Health, and are responsible for their own budgets(Connah & Pearson,1991). As a consequence, specialist care doctors are part of a large group of decision-makers, including managers and accountants. From the point of view of Compound UK at the time of the research study, not only had the criteria for purchasing pharmaceuticals products added cost savings to drugs efficacy, sales situations had also become far more complex, since client groups such as hospitals now included a wider range of actors in their purchasing decisions.

In 1993, the commercial function was reorganised into eight regions. It was thought that this would provide each region considerable autonomy to plan and respond to their own locality, and thus to make the organisation more responsive to the new market place. In 1996, the commercial function consisted of its director, eight regional managers, twelve area managers, and around 150 sales representatives(reps). All members of the commercial function, apart from the director, worked from their own homes, while employees working in other departments were located at the head office, Compound Square. These functions remained largely unchanged from the ways they were organised prior to the restructuring. The clinical and medical function consisted of the medical director, senior medical advisors, medical advisors and health economists. They undertook clinical trials in the UK

which are part of an international clinical trials programme. The marketing department performed market analysis, compiled the sales material, and arranged conferences.

As part of the response to the environmental changes, senior management felt that the organisation could become more competitive by encouraging employees to draw on all areas of the organisation to work and share information and knowledge across functional and geographic boundaries. Lotus Notes was seen as a software package that could assist with sharing information and improving group working, particularly between those working from their homes, and members located in Compound Square.

In addition to an electronic mail(e-mail) facility, there were three main uses of Notes after its introduction in Compound UK. First, it was used to create a database to support the co-operative activities involved in strategic selling. Strategic selling was a sales approach that helped employees to identify those individuals within a hospital or general practice that had a very strong influence in the purchasing decisions of hospital doctors, and other members of Compound UK who could act as coaches to assist in securing a sale. The shared databases supported this process by allowing views and contributions to be structured and shared between those involved in securing a particular sales account. A second use of Notes was the provision of a wide variety of shared discussion databases. Discussion databases provided a resource for employees to discuss issues that were of interest, or were of concern, at any moment in time. They typically focused on issues, products or a particular role. The final and most prevalent use of Notes was the contact recording database. This database provided a shared resource for employees to record details of customers. This is a widely used practice in selling companies, and had been present in various paper and electronic forms in Compound UK since the early 1970's. This paper focuses on how these elements of Lotus Notes were used to work across the geographic and

temporal boundaries that separated many employees, and most notably the sales force from those who were located at Compound Square.

5. Opening Up New Relationships for Boundary Crossing

This section draws on the detailed case material to indicate some of the opportunities that Lotus Notes presented for employees to work within and between functional, geographic and time boundaries. One significant opportunity that emerged after the introduction of Notes was the *increased discussion* that arose between employees working in the different functions. Much of this discussion was instigated and took place on the shared discussion databases, particularly those that centred on the company's products. They were used by employees to reassess the ways that the products were marketed and sold in the light of the different employee's expertise and experiences. For example, medical experts would make scientific data available, marketers would make their detailed market analysis available, and sales people would offer their detailed knowledge of the sales issues. Similar benefits arose with the role and region specific shared databases, where groups of employees with similar expertise would discuss and refine their views about particular issues. In general, being able to shape the development of issues that were under debate, was seen by many employees to be advantageous.

A further opportunity that emerged for crossing functional boundaries was the *increased awareness* that arose from their use of the contact recording and strategic selling databases. Prior to the introduction of contact recording on Notes, employees had details about doctors in their heads, scribbled in file-o-faxes, or at best, were on a card filing system. Consequently, many details were not capable of being known by other employees within the same or different functions. However, with the introduction of Notes, employees would

record specific details about doctors on the contact recording database, such as what he or she looks for when prescribing drugs, areas of specialism, involvement in clinical trials and any contacts they already had in Compound UK. This allowed employees in all functions to review the database before visiting doctors, and upon their return, would then contribute any details that they felt other employees may benefit from being made aware of.

The introduction of strategic selling on Notes provided similar opportunities(Miller et al.,1988). Reps in particular, would draw on the guidance provided by the concepts underlying strategic selling to structure a complex sales situation, and to work closely with experts most typically in the medical function, who would provide guidance on medical issues up until the account was won or lost. They also presented opportunities for medics to identify doctors that may participate in clinical trials of a new drug. Strategic selling sheets also provided a source for discussion during regional meetings, where colleagues would provide suggestions and advice, coaches would often be suggested for particular accounts and area managers would assist more directly in trying to secure a sale.

The *ongoing development of the chronology of details* about particular doctors presented opportunities for both the sales and the clinical trials process. This was seen as being particularly beneficial for new reps or medics joining the company, or existing employees changing their job, to see the network of relationships and issues that surrounded a particular doctor, practice or hospital.

Notes was also central to *bridging the different times of working* between members of the sales force and employees located at Compound Square. The latter usually worked between 9-5, while the sales force were typically unavailable during the day, as they would be out visiting doctors. These incompatible times of working had previously made co-

operation extremely difficult, however, Notes allowed reps to review and respond to their electronic mail and the shared databases before they left home in the morning or when they returned in the evening.

6. Challenges Posed to Boundary Crossing by Working Discursively

Though working discursively on the shared databases presented considerable opportunities for employees to work across boundaries, it was not without difficulties. This section explores the difficulties that many employees had with this shift towards groupware supported multi-disciplinary working that spanned functional, spatial and temporal boundaries. Several employees expressed their unease with *making many of their activities, thoughts and understandings discursive on the shared databases***.** Often the information recorded on Notes was portrayed as being highly personal and meaningless unless it was read by the people in the same locality and/or from the same background, as one medical expert mentioned:

"I can put letters onto the database, but not my whole diary. You can not put this level of detail into a Notes database, and much of what I do input must be meaningless to others".

Thus, much of what employees were able to make discursive on the shared databases was only felt to be a simple representation of what they sought to convey. Others explained that relationships could never be recorded discursively on Notes, as one rep explained:

"I know every doctor and receptionist on my patch, I can see anyone I want. I have had to do a lot of work to earn the GP's respect, it did not happen over night and no amount of

contact recording or strategic selling can account for the relationships that I have built up".

Thus many reps were adamant that no amount of information recorded, however detailed, would be sufficient to allow other employees the detailed access to doctors that reps with long established relationships could have.

The extent to which details could be recorded was further limited due to the legal constraints embodied in the *Data Protection Act(1988).* Many wanted to record much more of the information that was in their heads and diaries than they thought this act allowed, as was explained by a regional business manager:

"You can not put detailed information onto Notes because of the Data Protection Act. It would probably be better having bits of paper card with the details on than the bare bones that is allowed on Notes".

A good example of the limitations the legal constraints presented was how many reps wanted to record a particular doctor's car type and registration number, as this was an indication of which doctors were working that day in the hospital or general practice. However, though this was seen as a time saving and important piece of information they were unable to record details of this sort due to the Data Protection Act.

A further difficulty that pervaded crossing functional boundaries was the *limited awareness of what it was to occupy the role of another employee.* Employees occupying different positions in separate functions had different backgrounds and perspectives, which resulted in significant difficulties in sharing conceptions between employees who worked centrally

in Compound Square and those who worked in the field force. Employees based at Compound Square were critical of members of the field force, and suggested that reps were unaware of many of the benefits their work had to the rest of Compound UK. They were particularly scathing of the sales force with regards to the quality and amount of details they recorded on the contact recording and strategic selling databases. Several employees located at Compound Square felt that if reps had provided them with comprehensive details then they could work together less problematically, as an IS developer mentioned:

"They(reps) do not see the wider picture, and as such do not see the benefits of their extra work(sic) to the rest of the company".

However, this criticism was resented by the sales force. Reps claimed that employees located in Compound Square did not care about or comprehend the implications that some of their activities had on them. For example, even when sales people had recorded information on the shared databases, they would still receive e-mail requests from those working centrally who required this information. They were furious with this as they felt their time spent composing and recording the information was wasted. It also left them feeling ill disposed to recording detailed information in the future.

Many employees were also *fearful that misunderstandings may arise from recording information permanently on the shared databases.* On some occasions this had been detrimental to the company. For example, meeting organisers would review the reps contact recording database looking for doctors that were favourable disposed to Compound UK's products, so they could invite them to conferences they were organising. However, on one particular occasion, a meeting organiser had received a phone call from Dr. Jones who had heard from a colleague of his that a conference was to take place, and was fuming

that though he had recently bought £10,000 worth of one of their drugs, he had not been invited. When the meeting organiser asked the rep why he had not made this clear on the contact recording database, he replied that he thought he had. The meeting organiser explained that a knock on effect would be that the next Compound UK person to contact Dr. Jones would get a terrible reception, and thus, felt that something needed recording on the contact recording database to inform others of his mistake. Episodes such as these, had led to many employees to fear the repercussions that may arise from recording their views on the shared databases. This led many to make a minimal use of many of the discussion databases, as a senior medical advisor mentioned:

"I am always careful about what I record. My rule is never to criticise people through the computer. You can offend on a computer even when you don't mean to".

Many employees were not confident that they could make their views on a particular issue clear on the databases, and feared offending others. Furthermore, other less confident employees feared that what they wrote may appear stupid or irrelevant to other employees. This non-participation resulted in many experts' views, experiences and activities being invisible to other employees.

Further restricting the ability of employees located in the field force to work with employees located in Compound Square were the *differing times of working*. Employees located within Compound Square had complained about the time that reps took to respond to their requests which had often resulted in many issues that they required a rep's contribution to no longer being relevant. However reps resented this criticism, and argued that many employees based at Compound Square did not appreciate that they were unable to respond promptly to their requests, as they were out on the road visiting doctors during

the day, and often holding conferences or social events during the evening.

Compounding the difficulties reported in this section were the increased workloads that were associated with using the different components of Notes, particularly to bridge the divides between the sales force and Compound Square. The collaborative activities that Notes was introduced to support were in addition to their existing activities and responsibilities. Consequently, reps in particular, had little time to develop relationships with employees located within Compound Square. Within the functions, due to the continuation of regular meetings, and the use of Notes being less problematical, this meant that the increased workload did not present significant difficulties.

7. Facilitating Boundary Crossing

This section will present the strategies that several employees adopted to ease some of the limitations reported in the previous section. However, it is important to bare in mind, that these activities were the exception rather than the norm.

Some employees were highly critical, that since Notes was introduced, the number of face-to-face meetings that took place between employees located within Compound Square had reduced. Several employees had recognised the difficulties arising from this, and intentionally developed strategies to *encourage and develop face-to-face discussions and relationships between functions located within Compound Square*. For example, James Black, a senior medical advisor, explained that if people located in Compound Square sent him a lengthy e-mail, he would send a reply back saying: “call in and talk to me about it”. Or, if someone had made an interesting comment on the discussion databases, he would arrange a meeting to talk this through. As he explained:

"Before Notes was introduced, people in Compound Square would come and see you. The clever people still keep the personal side up".

James Black also played an active part in instigating and maintaining cross-functional teams. For example, he explained that he was part of a marketing team that follows four products, one in development and three already on the market. This team consisted of four marketers, the strategic selling manager, the head of finance and one medic other than himself. He also arranged to have lunch regularly with experts from different functions that he had, or was, working with. He explained that initiatives such as these had assisted the participants to better appreciate the agendas of members from different functions.

However, deliberately *instigating and maintaining relationships between employees located in Compound Square and the sales force required considerably more thought and effort.* One example of such activities was how James Black had deliberately participated in the six week induction programme for new reps, as well as attending regional meetings, training courses for existing reps, the bi-annual reps conference, in addition to accompanying many reps on their visits to doctors whenever possible. He viewed these interactions for both him, and those he was interacting with, as an opportunity to introduce themselves, outline what they did, what they required, the difficulties they faced, as well as how best to interact with each other.

"I make it my business to meet reps on their introduction and training courses as well as at regional meetings. I do this so they feel confident enough to call me if they need me. I also try to go out and meet doctors with reps when ever possible".

Reps welcomed his efforts, explaining that it made them comfortable to contact him to ask for assistance, as well as providing both him and them with a deeper understanding as to what was involved in being a medic or a rep. Several experienced sales reps and area managers adopted similar strategies with employees located in Compound Square, arranging meetings, engaging in regular telephone conversations and inviting them to regional meetings or visits to doctors. As one experienced rep mentioned:

"You gain more from a medic or product manager on the phone than you do on a strategic selling sheet. This way you get their impression of the person, and you can build up a picture of them".

Furthermore, some would try to get around not being able to record sensitive information due to the Data Protection Act by writing in the contact recording or strategic selling databases: "have sensitive information call me". Similar strategies were also adopted by employees who feared that the information they recorded may be misunderstood.

Also implicated in the activities that several employees performed was the *use they made of the strategic selling database to encourage work across boundaries*. For example, area managers would regularly review their reps' strategic selling sheets, and often-suggested coaches for them to work with. Coaches would work closely with reps throughout the sales process until an account was won or lost, talking regularly on the telephone, in face-to-face meetings, whilst also accompanying reps on visits to senior doctors. Opportunities for clinical trials also arose from these interactions. Employees suggested that by working in this way, it allowed them an increased familiarity with individual personalities, as well opening up a forum of discussion surrounding the assumptions and perspectives of experts from different functions.

8. Boundlessness, Boundedness and Perspective Making and Taking

This penultimate section is divided into three subsections that explore the issues reported in the previous section with reference to Boland and Tenkasi's(1995) theoretical conception of knowledge work.

8.1 Opportunities presented from the boundlessness of CSCW technology

The opportunities that arose for perspective making and taking will be explained in this subsection with reference to the construct of boundlessness. Boundlessness refers to the lever that co-operative technology provides for local relations to be lifted out of their local context of interaction and 'stretched' across functional, geographic and temporal boundaries(Schultze and Boland,1997; Giddens,1991). This lever provided for the intersection of social worlds that had previously operated relatively independently from each other.

Issues Emerging
⇒ Discuss and reflect upon how they went about their work within functions.
⇒ Organisation-wide databases also allowed employees within particular functions to locate themselves within the diversity of perspectives.

Table(2) Opportunities for perspective making with the use of co-operative technology

As is summarised in table(2), the opportunities for perspective making arose by employees within long established functions expressing their views on the community-specific

databases, such as the role specific or regional discussion databases. This presented opportunities to *discuss and reflect upon how they went about their work within functions*. One example provided in section 5, was how reps would refer to the strategic selling sheets at regional meetings to discuss the possible ways to approach a particular complex sales account.

The use of organisation-wide databases also allowed employees within particular functions to locate themselves within the diversity of perspectives. This was achieved by employees expressing their views, or revising or commenting on the perspective of another on the organisation-wide databases. They also provided a resource for new and existing employees to comprehend the historicity of activities undertaken by colleagues in their own function, as well as the opportunity to locate themselves within the diversity of perspectives.

Issues Emerging
⇒ Discussion on the function or role specific databases about how they may engage with others who have a different formulae.
⇒ Organisation-wide discussion databases did provide an initial opportunity for those in different functions to take qualitatively different conceptions of others into account.

Table(3) Opportunities for perspective taking with the use of co-operative technology.

As table(3) summarises, when *discussion occurred on the function or role specific databases about how they may engage with others that have a different formulae*, the use of Notes also provided an opportunity for perspective taking. Giddens(1984: 22) views formulae as referring to taken for granted knowledge, which remains unarticulated, but which is modified by members of a society in the course of their interaction. On the

function or role specific discussion databases dialogue between members of the same community did allow some employees to alter their ways of working with other communities and draw on a wider base of expertise than they had in the past.

Though discussion and reflection on organisation-wide databases was more limited, they did *provide an opportunity for those in different functions to take the qualitatively different conceptions of others into account.* For example, after the development of organisation-wide databases medics would discuss issues with sales reps. In addition, the chronology of the activities recorded on Notes provided an insight into the perspectives of the different expert groups. In this sense, Notes provided a facility to bridge the functional, geographic and temporal separations that had previously restricted communication within Compound Square, and most significantly, between the head quarters and the field force, and thus was implicated in providing opportunities for perspective making and taking.

8.2 Bounded nature of knowledge work

This subsection will contrast the opportunities that arose from the boundlessness of activities arising from the use of Notes with reference to the limitations that surrounded the bounded nature of work(as is summarised in table 4). Here, boundedness refers to the historically-located mastery of actors, and the temporality of daily life. The opportunities arising from the use of CSCW technology for the perspective making process presented in the previous subsection, arose what from King and Star(1990) term 'local memory,' i.e. *intimate understandings and experience of working with others in the same function*. This local memory was sustained through not only the use of Notes, but also the regular formal and informal face-to-face discussion and interaction. However, though working within functions benefited from subtle social factors and shared mastery, working between

functions did not benefit to the same extent from these factors, and this presented difficulties in the perspective taking process.

Concept	Issues emerging
Perspective making	⇒ Intimate understandings and experience of working with others in the same function.
Perspective taking	⇒ No history or mastery of working with employees in other functions. ⇒ The limited extent to which an actor can make his experiences and perspectives discursive on the various components of the co-operative technology. ⇒ The functionality of the technology and the Data Protection Act. ⇒ The propensity for misunderstanding led to some employees not contributing, or only contributing in a limited way. ⇒ Increasing work-loads associated with working collaboratively across functional, spatial and temporal boundaries.

Table(4) Issues arising out of the bounded nature of work for knowledge production

Lotus Notes was introduced, in part, to provide a way for employees located in the different functions to be able to communicate and collaborate with each other. However, historically little interaction had occurred between functions, particularly between the sales force and employees located in Compound Square, and as a result, employees had limited mastery of working with each other. After the introduction of Notes, formal meetings continued to be function-specific, leaving the organisation-wide databases as the main way for employees located in the different functions to collaborate together.

Table(4) indicates the significant difficulties for perspective taking due to employees having *no history or mastery of working with employees in other functions.* The difficulties that arose from the bounded nature of work, can be further illuminated by drawing on Giddens(1979: 73) who notes that: "We have to recognise that what an actor knows as a competent - but historically and spatially located - member of society, 'shades off' in contexts that stretch beyond those in his or her day-to-day activity". In Compound UK, many misunderstandings were associated with relying on Notes to work between historically and spatially located communities. Many reps, medics and marketers were unsure about what they required from each other, and exactly how they could draw on the expertise and experience of each other. This contextual bounding of an employee's mastery limited their ability to take each others ways of working and backgrounds into account.

Working within, but particularly across functional boundaries when there was a reliance placed on using shared databases, was restricted further due to *the limited extent to which an actor could make his experiences and perspectives discursive on the various components of the co-operative technology*. These limitations can be further explained by drawing on the distinction Polanyi(1966:4) makes between tacit and explicit knowledge. Tacit knowledge is personal, context specific, and therefore hard to formalise and communicate. It consists of all the things which actors know about how to 'go on' in the contexts of social life without being able to give them direct discursive expression. Explicit or codified knowledge, refers to knowledge that is transmittable in formal, systematic language. Within functions, due to employees long established histories of working closely together and undertaking similar activities, they could draw on their shared tacit knowledge, to skilfully interpret and make judgements concerning the views recorded on the shared databases by members of their own functions. As Nonaka & Takeuchi(1994) explain:

"Sharing tacit knowledge requires a simultaneous processing of the complexities of issues shared by the individuals". Though this facilitated the perspective making process, due to the limited experience and skills that employees had in working between functions, the degree to which they could understand the views of members of other functions was more limited and often resulted in misunderstandings. This resonates with Collins' (1987) account of expert systems, which he suggests will encounter difficulties when users do not have the background and skills to make sense of minimal information. In the context of Compound UK, this was fundamental to limiting the perspective taking process. *The functionality of the technology* and the caution employees exercised due to the *Data Protection Act(1989)* compounded these limitations, particularly between functions.

The propensity for misunderstanding led to some employees not contributing, or only contributing in a limited way as they were scared that their comments 'may come back to haunt them.' As table(4) indicates with reference to the perspective taking process, by not contributing, or only contributing in a limited way to the organisation-wide discussion databases, this restricted the extent to which each function could make unique representations of their understandings available on the shared databases. However, within functions, employees would engage in discussion and reflection about how they went about their work without the fear of being misunderstood, which allowed for the strengthening of perspectives within functions.

Opportunities for perspective taking were further limited due to the use of Notes being in addition to their existing workloads. This *left little time for experts to collaborate across functional boundaries*, and particularly across spatial and temporal boundaries which required considerable effort. This was not as problematical with respect to the perspective

making process as regular interactions within functions had always represented part of the typical workloads of reps, medics and marketers.

8.3 Opportunities provided by mediators

This third subsection will explore how the deliberate strategies several employees adopted, reduced some of the limitations to the perspective taking process reported in the previous subsection.

Issues emerging
⇒ Aware of how many employees were fearful of what they recorded on Notes being misunderstood.
⇒ Importance of initiating and maintaining relationships.
⇒ Conceptual framework underpinning strategic selling.

Table(5) Mediating the perspective taking process

As the first point in table(5) indicates, some employees were *aware of how many employees were fearful of what they recorded on Notes being misunderstood*. To try to counter-balance this, instead of recording contentious or complex information, some employees would seek to initiate a telephone or face-to-face meeting. This encouraged more in-depth forms of interaction, and lessened some of the limitations for the perspective taking process reported in the previous subsection.

The awareness that several employees had of the *importance of initiating and maintaining relationships* was implicated in negating some of the limitations that arose from employees working discursively on Notes with experts located in contexts that they had limited

mastery of working in(Giddens,1979). Several employees had invested considerable time, patience and effort in arranging and encouraging face-to-face meetings rather than relying on the different components of Notes to work across functional boundaries. They also socialised with experts based in different functions whenever possible. This effort was magnified many times when strategies such as these were adopted to work across the field force and HQ boundaries.

The *conceptual framework underpinning strategic selling*, and its electronic form, was drawn upon by some employees to instigate more in-depth forms of collaboration, particularly between employees located in Compound Square and members of the field force. This provided guidance about how the contributions of diverse experts could be structured, and provided a framework to critically reflect upon and debate how to approach a complex sales situation, or why an account was having difficulties. This allowed experts to be aware of, and consider the approaches advocated by experts in other functions.

By seeking to develop working relationships, medics, marketers and members of the field force became more familiar with what members of other functions required from them, and as the relationships developed over time, countered some of the limitations arising from the bounded mastery of employees. In this sense, as the histories of experts working together became more intense, informal and routine, and the 'bar' between explicit and tacit knowledge became more permeable. This was evident in how several employees had developed social skills that allowed them to work with more immediate ease in what had previously been culturally alien contexts(Giddens,1979). Though they were few and far between, those individuals that had consciously sought to develop and share, in Collins'(1987) terminology, "a framework of interpretation" had generated opportunities for discussion and reflection to ensue concerning the ways that other functions worked, and

how they could best interact with them. This helped members of the different functions to locate themselves within the overall activity and assisted in the perspective taking process.

In relation to the increasing workloads, though mediators were aware of the increasing workloads that reps in particular were undertaking, mediators could only go so far in terms of mitigating some of the limitations this presented to the perspective taking process. This took the form of them being more patient, completing as much of the collaborative task as possible, and indicating the benefit of working across functional, spatial and temporal boundaries.

9. Conclusions and Implications

This study set out with the specific intention of considering how the disembedding of social relations and their rearticulation across different tracts of time and space are implicated in knowledge working. The first four subsections consider the implications and conclusions in relation to Boland and Tenkasi's(1995) theoretical conceptualisation of the role of information communication technologies(ICT's) in knowledge working. Following this, some normative suggestions for designers are presented. Finally, some provisional observations about how information systems are inextricably inter-linked with the emerging character of contemporary society will be discussed.

9.1 Boundlessness/boundedness and knowledge working

The first conclusion to be drawn from this study, concerns the opportunities and limitations arising from the boundless and bounded interactions that surrounded the use of CSCW technologies, and the implications of this for knowledge working within and between

boundaries. This study indicated that the boundlessness of the activities that CSCW systems mediate does present opportunities for knowledge work. However, these opportunities were only possible due to the long established histories, or shared local memory that members working within functions could draw upon to make sense of the information recorded by colleagues on the functional or role specific databases(King & Star,1990). Suchman's(1987) seminal work reinforces this point, where she notes that: "shared knowledge is a potentially innumerable body of implicit assumptions or presumptions that stands behind every explicit action or utterance, and from which participants in interaction selectively draw in understanding each other actions". Perspective making benefits from the tacit knowledge within groups, which allows them to understand the subtleties that underlies the meaning expressed on the shared databases. In this sense, we concur with Boland and Tenkasi(1995), that shared discussion forums do benefit the perspective making process, but only due to the fact that explicit knowledge always rests on tacit knowledge(Polanyi,1962), which within functions was shared to a great extent.

However, the tacit assumptions, premises and rationale's that underlay the actions and views undertaken by employees in other functions were not shared to the same extent, and resulted in the reliance on working discursively on the shared databases to be problematical. As Polanyi(1962:101) indicates: "when a person is untrained into particular activities, they have only broad, undifferentiated outlines of it in their mind, rather than a set of refined distinctions." He continues by noting that individuals draw distinctions within a collective domain of action which requires sustained interactions(Tsoukas & Vladimirou,2000). In essence, much of this premise is integral to Boland and Tenkasi's(1995) notion of perspective taking, but this study has indicated that this is highly problematical when there is a reliance on shared ICT forums as they advocate. The

conceptualisation for knowledge working between different groups, particularly when devoid of time and space, does not consider how work is necessarily situated and bounded, and that misunderstandings when one relies almost exclusively on working discursively on ICT's are inevitable, or at best likely. We need to question the extent to which tacit knowledge can be shared when their is a reliance on ICT based shared forums to initiate and sustain social interactions.

9.2 Increasing and unequal workloads and knowledge working

One issue that has pervaded the CSCW literature over the last decade has been Grudin's(1990) distinction between "who does the work and who gets the benefit"(Bowers,1995). Grudin(ibid.) argues that: "Given the different preferences, experience, roles, and tasks of members of a group, a new groupware application will never afford every member precisely the same benefit. When it is introduced, some people will have to adjust more than others….most groupware requires additional work for some users, who enter or process information that the application requires or produces". In Compound UK, members of the field force had the most significant demands placed on them, which resulted in them being reluctant to engage in in-depth collaboration with others who they have previously had little contact with. For perspective making, this was not as troublesome. Within functions regular interaction(in the form of meetings and day-to-day encounters) had always taken place and were continued following the introduction of Notes. Furthermore, due to the shared assumptions, the time spent interpreting, understanding and acting upon views expressed on the shared databases was not significant. However, between functions, collaborating with experts located in other functions was in addition to their existing activities. This left little time for employees to engage in the new forms of work, which extenuated the difficulties that plagued boundary crossing due to the

lack of tacit understanding of another experts perspectives and ways of working. These difficulties were amplified for the sales force, as they were required to undertake the lions share of the workload Notes brought about. Consequently, we suggest that Boland and Tenkasi's(1995) theoretical framework could usefully be extended to consider the issues surrounding increased and unequal workloads that often surround the introduction of CSCW systems(Grudin,1990).

9.3 The development of frameworks of interpretation

Furthermore, this study has also examined the strategies that some employees consciously performed to work around the constraints they encountered stemming from the bounded nature of work. These strategies involved renegotiating the structures of meaning in order to find ways to manage the tensions between the competing agendas, as well as alleviating the misunderstandings and restrictions arising from the legal constraints and the functionality of the technology. These mediators of boundedness were in a unique position due to the experience and skills that they had gained working across functional boundaries prior to Notes being introduced. They had already developed a framework of interpretation between different social worlds which allowed them to not only comprehend the meaning represented by one particular community(Collins,1987), but also to encourage others to appreciate and understand the form-of-life that typified a community that they had typically had little experience of interacting with. In Collins'(1987) terms, these mediators endeavoured to fill in the gaps between the backgrounds and meanings that merged as two communities worked together assisted by Notes' shared databases. Mediators undertook what Star and Gerson(1987) term "performances", which involves making sense of "frozen inscriptions" by fiddling and adjusting representations "to make them fit local circumstances". This study has indicated that those individuals that may be able to

undertake these performances are likely to be those that are particularly skilled to start off with due to the exposure and experience they have already gained(Collins,1987).

In relation to Boland and Tenkasi's(1995) theoretical conceptualisation of knowledge work, this study has suggested that employees who can act as mediators of boundedness between the interacting communities are vital to both the perspective making and taking process. Mediators provide opportunities for employees to refine the perspective making process by locating themselves within the diversity of perspectives, and the perspective taking process by encouraging other employees to take into account the perspective of different experts located in other communities in their activities. Over time, this mediating process will equip members of the different communities with enhanced skills to deal with increasingly diverse issues and to make ever finer judgements as future interactions come about and are reflected upon. Thus the role of groupware systems to support the knowledge work process is likely to reside in their role being assistants to skilled mediators of boundedness, rather than as Boland and Tenkasi(1995) imply, as repositories to encode and share details for any member of the organisation to interpret and act upon devoid of context.

9.4 Boundary objects and knowledge working

The conceptual framework underpinning strategic selling was also explained to have provided an interface or a "common coin" between diverse groups. They provided opportunities for an exchange of views and a conceptual idea of how different expert groups may best interact in the selling process. In this sense, strategic selling sheets acted as a form of what Star and Griesemer(1989) term "boundary objects", which they describe as: "objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across

sites". Through the ongoing use of the strategic selling database, protocols of interaction, which went beyond mere trading across unjoined world boundaries, became established which enhanced the ability of employees to understand how the perspectives differed, and subsequently were increasingly able to take into account the perspectives of others in the selling process. In this sense, boundary objects were central to the development of frameworks of interpretation(Collins,1987; Hayes,2000). This further extends Boland and Tenkasi's(1995) account, by considering how shared databases, which have the dual nature of being both abstract and concrete(Bowers,1995), may act as 'temporal bridges' which provide a conceptual and physical resource to support the development of frameworks of interpretation, which we consider to be central to the perspective making and taking process. Further to this, by bringing diverse experts together in this way, they also raised opportunities for new forms of collaboration outside the parameters of strategic selling, such as in the clinical trials process.

9.5 Normative design guidelines

What does this mean for the design and introduction of groupware technologies that are intended to support the knowledge work process? The strategies used by its participants are several sophisticated answers to the problems of the complex issues that arise when working across functional or community boundaries, and will be drawn upon to suggest a number of normative guidelines that designers may consider when developing and introducing groupware technology to support knowledge working.

First, designers need to recognise that work, and representations of their work are spatially and temporally situated. This implies that groupware systems do present opportunities for knowledge work within boundaries, but this optimism needs to be tempered when

interactions span functional boundaries often in different geographic locations. Consequently, designers may need to accept that requests for organisation wide shared databases need to be rebuffed until they are satisfied that there are at least several participants who have the experience and skills which may mitigate some of the limitations arising from the bounded nature of work. Relatedly, we suggest that designers recognise the often invisible role that mediators play in encouraging others to make sense of the interactions they have with members of other communities. By doing this, mediators perform a vital and unrecognised role in equipping others with an enhanced ability to deal with increasingly diverse and complicated issues as their experience develops. This suggestion runs contrary to recent initiatives which have often eradicated levels of middle management, and ironically in the process, have lost the experience and skills that is essential to forms of work that involve ICT supported collaboration across functions(Hayes & Walsham,2000a; Hallier & James,1997). A further suggestion relates to the need for designers to consider the creation of boundary objects, entities which can, in some sense, be shared across different social worlds, yet have a variable significance between them(Bowers,1995). We suggest that the development of shared conceptual frameworks which provide an understanding of how and when different communities should interact with each other, as well as concrete fields which require completion by varying experts provide a starting point for doing this.

To bring about some of these normative guidelines, we suggest that designers could invest in education programmes that consider how their company intends to share and develop knowledge between disparate communities. These programmes could explore issues such as how communities differ from each other, repeat stories and examples of when technology may or may not be the most appropriate way to engage in developing an appreciation of the perspectives of employees located in other functions, and importantly,

sharing tales of the innovative strategies that some employees have devised to work across boundaries. Also developers may also discuss how collaborative technology may differ from their previous conceptions of stand alone technology, or network technology with a limited scope(Orlikowski,1993). This will require levels of ongoing investment and senior management commitment that is typically not associated with groupware implementations(Grudin,1990), which may be one of the most difficult issues to address. Underlying these suggestions for designers are the problems reported in this study, and others(Grudin;1990; Bowers,1995), associated with the increasing workloads. Designers need to recognise that without consideration of how they may mitigate the inequality and increased work loads that may result from the introduction of CSCW systems, then the normative suggestions made in this subsection will be undermined.

9.6 Articulating the role of IS in theories of 'late modernity.'

A final implication arising from this study, is how issues surrounding time/space interaction are likely to be central to the study of information systems in contemporary organisational contexts. This study drew on Giddens(1990;1991) insights to develop the constructs of boundlessness and boundedness. In relation to the theme of this study, by drawing on these constructs, knowledge work should not only be viewed as being tentative, fragmented and an essentially pragmatic social construct, but is also simultaneously distanciated and abstract(Blackler et al.1997). Though several studies have emerged over recent years that have drawn on Giddens'(1991) ideas to investigate late modernity in relation to IS, trust and professional identity(Barrett & Walsham,1999; Walsham,1998), non have considered ideas of late modernity in relation to CSCW and knowledge working. It is hoped that the constructs of boundlessness and boundedness, and how they confirm and develop Boland and Tenkasi's(1995) innovative work on perspective making and taking, may assist

information systems researchers to further consider the implications arising from the disembedding of social relations and their rearticulation across different tracts of time and space that information technologies provide for knowledge working. This study advocates further empirical studies that consider how information systems are implicated in broader societal transformations, and modestly presents the concepts of boundlessness and boundlessness to assist in this process.

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